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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/590,744	05/17/2007	Marco Friedrich	5367-256PUS	1203
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Thomas Langer Cohen Pontani Lieberman & Pavane 551 Fifth Avenue Suite 1210 New York, NY 10176				
EXAMINER				
PATEL, ISHWARBHAI B				
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary**Application No.**

10/590,744

Applicant(s)

FRIEDRICH ET AL.

Examiner

ISHWARBHAI PATEL

Art Unit

2835

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 25 January 2012.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on ____; the restriction requirement and election have been incorporated into this action.
- 4) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 5) ☒ Claim(s) 1-5, 7-9 and 11-36 is/are pending in the application.
- 5a) Of the above claim(s) 26-31 is/are withdrawn from consideration.
- 6) ☒ Claim(s) 36 is/are allowed.
- 7) ☒ Claim(s) 1-5, 7-9, 11-25 and 35 is/are rejected.
- 8) ☒ Claim(s) 32-34 is/are objected to.
- 9) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 10) ☐ The specification is objected to by the Examiner.
- 11) ☒ The drawing(s) filed on 07 October 2010 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 12) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date ____
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date ____
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: ____

DETAILED ACTION

1. This action is in response to amendment filed on January 25, 2012.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1, 3, 4, 7-8, 11, 15, 16, 19 and 21-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuan (US Patent No.6, 860,620).

Regarding claim 1, Kuan, generally in figures 3-4, discloses a light emitting diode arrangement, comprising a flexible circuit board (103) comprising electrical conductor tracks (121, 123, 124 and 126) and a thermally conductive layer (heat sink track 122, 125) and at least one high power light emitting diode (102) mounted onto said flexible circuit board and in thermal contact with the thermally conductive layer (see partial figure 5), wherein the thermally conductive layer and the electrical conductor tracks are positioned in a same plane of the flexible circuit board (see figure).

Kuan does not explicitly disclose the thermally conductive layer occupies at least 60 % of an area of said same plane. However, Kuan further recites that the substrate may also include a heat sink metal frame (108) arranged on the substrate in contact

with the thermally conductive layer (conductive layer forming heat sink track 112, 125, column 4, line 1-8, column 3, line 50-55). This implies that increasing the area of heat conductive layer will facilitate better heat removal performance.

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to provide the board of Kuan with the thermally conductive layer occupying at least 60 % of an area of said same plane, as further recited by Kuan, in order to have better heat removal rate.

Further, it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or working ranges involves only routine skill in the art. *In re Aller*, 105 220 F.2d 454,456, 105 USPQ 233, 235 (CCPA 1955). Also, it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Regarding claim 3, the modified structure of Kuan further discloses the high power light emitting diode is soldered onto the flexible circuit board (column 4, line 40-50).

Regarding claim 4, the modified structure of Kuan further discloses the flexible circuit board contains at least one flexible carrier layer (103).

Regarding claim 7, the modified structure of Kuan further discloses the thermally conductive layer contains a metal (column 3, line 42-49).

Regarding claim 8, the modified structure of Kuan further discloses the thermally conductive layer contains copper (column 3, line 42-49).

Regarding claim 11, the modified structure of Kuan further discloses the thermally conductive layer and the electrical conductor tracks contain the same metal (column 3, line 42-49).

Regarding claim 15, the modified structure of Kuan further discloses side of the flexible circuit board which is remote from the high power light emitting diode has an adhesive-containing layer (104).

Regarding claim 16, the modified structure of Kuan further discloses the adhesive-containing layer is formed by a double sided adhesive tape (as it is bonded on both sides, with 103 and 105).

Regarding claim 19, the modified structure of Kuan further discloses the adhesive-containing layer is covered with a protective film (105).

Regarding claims 21-25, the modified structure of Kuan further discloses a multiplicity of high power light emitting diodes are provided, which diodes are connected in series (claim 21); a pair of contact areas is provided for each high power light emitting diode (claim 22); has sections, each section having a high power light emitting diode and the associated pair of contact areas (claim 23); the sections are arranged as repeating structures (claim 24) and the sections are arranged in a series (claim 25), as disclosed in figure 1-5.

4. Claims 2, 9, 12-14, 17-18, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kuan (US Patent No. 6,860,620) as applied to claim 1 above.

Regarding claim 2, Kuan discloses all the features of the claimed invention as applied to claim 1, including the high power light emitting diode but does not explicitly disclose the diode with a power consumption of at least 300 mW.

However, diode with 300 mW power is known and the diode will be selected to have desired light intensity in the system.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of applicant's invention to provide the arrangement of Kuan with the diode having a power consumption of at least 300 mW, in order to have desired light intensity in the system.

Regarding claim 9, Kuan discloses all the features of the claimed invention as applied to claim 1, including the at least one high power light emitting diode and the thermally conductive layer but does not disclose the high power light emitting diode is

soldered onto the thermally conductive layer. Kuan discloses the using a thermally conductive glue.

However, soldering the diode to the thermally conductive layer is old and known in the art to have better structural connection.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of applicant's invention to provide the arrangement of Kuan with the high power light emitting diode soldered onto the thermally conductive layer, in order to have better structural connection.

Regarding claims 17 and 18, Kuan discloses all the features of the claimed invention as applied to claim 1, including the adhesive-containing layer but does not disclose the adhesive-containing layer is heat-resistant up to temperatures of 250.degree. C. and the adhesive-containing layer has a thickness of at most 60 μm .

However, the adhesive layer is connected to thermally conductive layer and also transmit the heat. Therefore should be able to withstand the heat generated as well thin enough to transmit the heat as fast as possible.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of applicant's invention to provide the arrangement of Kuan with the adhesive-containing layer having heat-resistant up to temperatures of 250.degree. C. and the adhesive-containing layer having a thickness of at most 60 μm , to withstand the temperature without damage and to transmit the heat as fast as possible.

Regarding claim 20, Kuan discloses all the features of the claimed invention as applied to claim 1, including the protective film but does not disclose the protective film contains a plastic. However, depending upon use, if the system is to be used on another fixture which itself is going to work as a heat sink, the heat sink may not be attached to the arrangement but a plastic removable sheet is attached, which is known in the art.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of applicant's invention to provide the arrangement of Kuan with the protective film contains a plastic, in order to facilitate the storage of the arrangement before actual use.

Regarding claims 12-14, Kuan discloses all the features of the claimed invention as applied to claim 1, including the flexible circuit board but does not disclose an insulating layer is applied to one of the surfaces of the flexible circuit board (claim 12); the insulating layer has cutouts for making electrical and thermal contact with the high power light emitting diode (claim 13) and the insulating layer contains a soldering resist (claim 14).

However, providing solder mask on the board is old and known in the art to protect the surface from environmental damage.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of applicant's invention to provide the arrangement of Kuan with the insulating layer containing a solder mask as recited in claims 12-14, in order to protect the surface from environmental damage.

5. Claims 5 and 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kuan as applied to claim 4 above, and further in view of Becker (US Patent No. 7,273,987).

Regarding claim 5, Kuan discloses all the features of the claimed invention as applied to claim 1, including the flexible carrier layer but does not disclose the layer contains at least one of the following materials: polyimide, polyethylene naphthalate, polyester, FR4. Kuan discloses synthetic material such as polyamide (column 3, line 15-20).

Becker discloses light emitting diode arrangement and recite the flexible substrate made of polyimide (column 4, line 46-67).

Therefore, it would have been obvious to a person of ordinary skill in the art at the time of applicant's invention to provide the arrangement of Kuan with the flexible substrate made of polyimide.

Further, it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin* 227 F.2d 197, 125 USPQ 416 (CCPA 1960)).

Regarding claim 35, Kuan discloses all the features of the claimed invention as applied to claim 1 above but does not disclose at least one additional thermally conductive layer separated from the thermally conductive layer, wherein each of the

thermally conductive layer and the additional thermally conductive layer is connected to a different single light-emitting diode.

However, multiple unit with separate thermally conductive layer for respective unit is old and known in the art.

Becker in figure 7 discloses a light emitting diode arrangement with separate thermally conductive layer (100) for individual diode.

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to provide the board of Kuan with at least one additional thermally conductive layer separated from the thermally conductive layer, wherein each of the thermally conductive layer and the additional thermally conductive layer is connected to a different single light-emitting diode, as taught by Becker, in order to have multiple LED arrangement.

Response to Arguments

4. Applicant's arguments filed January 25, 2012 have been fully considered but they are not persuasive.

Applicant, about the rejection (35 USC § 103 (a)) of the independent claim 1, with the prior art to Kuan, argues that the Examiner simply ignores the fact that more material means higher manufacturing costs. A person skilled in the art at the time of the invention would design a heat removal area of a printed circuit board to be as large as necessary to remove the heat generated by the components to be mounted on the printed circuit board, and no more. See, for example, col. 3, lines 60-64, of Kuan, which

clearly indicates that cost is a design factor. Thus, one skilled in the art would not simply make the heat sink as larger.

Furthermore, Kuan discloses an arrangement in which the heat sink tracks are rectilinear and are arranged between rectilinear electrical conductor tracks. Therefore, the arrangement of the heat sink tracks is limited to the space between the electrical tracks. The space between the electrical tracks in Kuan is not 60% of the plane of the circuit board on which the conductor tracks are arranged. MPEP 2144.05(II)(B) states that a particular parameter must first be recognized as a result-effective variable, i.e., a variable which achieves a recognized result, before the determination of the optimum or workable ranges of said variable might be characterized as routine experimentation. In fact, Kuan discloses at col. 3, lines 55-60, that within the context of the configuration of Kuan, the thickness of the layer affects the heat sink capabilities.

Further, MPEP 2143 states that "it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does." KSR, 550 U.S. at ____, 82 USPQ2d at 1396. Here the Examiner is combining the teaching of Kuan with the general statement that a bigger thermally conductive layer is better. Only the present invention presents a different configuration of the electrical conductor tracks and thermally conductive layer that allows the thermally conductive layer to occupy at least 60% of an area on the circuit board. The inventors made this configuration so that the circuit board could accommodate high power light emitting diodes while maintaining a relatively small circuit board. Based on the teachings of Kuan, there is no reason that

one skilled in the art would have made an area of the heat sink layer to be at least 60% of the same layer in which the electrical conductors are arranged.

Examiner respectfully traverses.

The prior art to Kuan, though not explicitly discloses the thermally conductive layer occupies 60 % of an area of said same plane, it discloses providing additional heat removal area, over and above the heat removal track (column 4, line 1-8). This implies that the area of thermally conductive area would be increased / controlled to have desired heat removal rate.

Therefore, it would have been obvious to a person having ordinary skill in the art at the time of applicant's invention to provide the board of Kuan with the thermally conductive layer occupies 60 % of an area of said same plane, in order to have required heat removal rate.

Further, the fact that a combination would not be made by businessmen for economic reasons does not mean that a person of ordinary skill in the art would not make the combination because of some technological incompatibility. *In re Farrenkopf*, 713 F.2d 714, 219 USPQ 1 (Fed. Cir. 1983). Also, a person of ordinary skill has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely that product [was] not of innovation but of ordinary skill and common sense. In that instance the fact that a combination was obvious to try might show that it was obvious under § 103." *KSR International Co. v. Teleflex Inc.*, 550 U.S. ___, ___, 82 USPQ2d 1385, 1397 (2007).

In the instant case, the prior art specifically recite increasing the thermally conductive area explained as above in order to have better performance. Therefore, Kuan meets the limitation.

Allowable Subject Matter

5. Claim 36 is allowed.
6. Claims 32, 33 and 34 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

7. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Matsui (US Patent No. 6,857,767), in figure 3, discloses a light emitting diode arrangement multiple unit, each having separate thermally conductive layer.

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within

TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ISHWARBHAI PATEL whose telephone number is (571)272-1933. The examiner can normally be reached on M-F (8:30 - 5:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Timothy J. Thompson can be reached on (571) 272 2342. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Ishwarbhai B Patel/
Primary Examiner, Art Unit 2835
March 28, 2012